

CLAIMS

1. A twin sheet thermoformer apparatus including:

a frame;

an upper platen for mounting an upper thermoforming mold, said upper platen movable up and down on said frame through a range of positions thereof;

upper platen positioner means including platen drive means for selectively moving said upper platen to any position in said range of positions, said positioner means also including means for holding said upper platen stationary at positions within said range;

a lower platen for mounting a lower thermoforming mold on said frame, said lower platen positioned on said frame below said upper platen and movable up and down thereon towards and away from said upper platen through a range of positions;

lower platen positioning means including platen drive means for selectively moving said lower platen to any position in said range of positions, said positioning means also including means for holding said lower platen stationary at positions within said range;

a first set of vertical locking shafts mounted to said upper platen and a second set of vertical locking shafts mounted to said lower platen, each locking shaft in said second set aligned with a respective locking shaft in said first set;

coupling means operable to couple said first and second sets of locking shafts together after said upper and lower platen are moved together to a predetermined spacing therebetween;

adjustment means causing one of said first or second sets of locking shafts to be selectively adjusted so that said predetermined spacing between said upper and lower platen whereat said coupling means is operable is varied; and,

adjustment drive means for driving each of said adjustment means to cause simultaneous adjustment of said locking shafts in said one of said first or second sets, whereby uniform adjustment

of said predetermined spacing is carried out.

2. The apparatus according to claim 1 wherein each of said locking shafts in said one of said first or second sets of locking shafts is threaded and engages a respective nut member, each said nut member rotated by said drive means to carry out said adjustment.

3. The apparatus according to claim 2 wherein each said nut member is captured to prevent axial movement so that each locking shaft is advanced axially as nut members are rotated.

4. The apparatus according to claim 3 wherein said drive means includes a chain recirculated around each nut member, each nut member having a sprocket attached thereto engaged with said chain.

5. The apparatus according to claim 4 wherein said drive means includes a motor driving a drive sprocket to cause recirculation of said chain and simultaneous rotation of said nut members.

6. The apparatus according to claim 1 wherein said actuation means comprises a set of hydraulic cylinders each driving one of said second set of locking shafts to cause said lower platen and upper platen to be drawn together.

7. The apparatus according to claim 6 further including encoder means generating signals corresponding to the upward movement of said lower platen caused by operation of said hydraulic cylinders, said lower platen drive means responsive to said encoder signals to follow said upward movement of said lower platen to support the weight of said lower platen.

8. A twin sheet thermoformer apparatus including:

a frame;

an upper platen for mounting an upper thermoforming mold, said upper platen movable up and down on said frame through a range of positions thereon;

upper platen positioner means including platen drive means for selectively moving said upper platen to any position in said range of positions, said positioner means also including means for holding said upper platen stationary at positions within said range;

a lower platen for mounting a lower thermoforming mold on said frame, said lower platen positioned on said frame below said upper platen and movable up and down thereon towards and away from said upper platen through a range of positions;

lower platen positioning means including platen drive means for selectively moving said lower platen to any position in said range of positions, said positioning means also including means for holding said lower platen stationary at positions within said range;

a first set of vertical locking shafts mounted to said upper platen and a second set of vertical locking shafts mounted to said lower platen, each locking shaft in said second set aligned with a respective locking shaft in said first set;

coupling means operable to couple said first and second sets of locking shafts together after said upper and lower platen are moved together to a predetermined spacing therebetween; and,

actuator means including a set of hydraulic cylinders, each hydraulic cylinder pulling one of said locking shafts in one of said first or second sets so as to draw said upper and lower platens together.



9. The apparatus according to claim 8 further including a flow divider means supplying each of said hydraulic cylinders so as to equalize flow to each hydraulic cylinder and insure uniform travel of all portions of said upper and lower platens towards each other.

10. The apparatus according to claim 8 further including means positively limiting the stroke of said hydraulic cylinders to positively limit the travel of said upper and lower platens toward each other by operation of said cylinders.

11. The apparatus according to claim 9 further including encoder means generating signals corresponding to the travel of said lower platen caused by operation of said hydraulic cylinders, said lower platen drive means responsive to said encoder signals to drive said lower platen correspondingly, whereby said platen drive means carries the weight of said lower platen.

12. The apparatus according to claim 9 wherein said flow divider comprises a series of positive displacement rotors coupled together, hydraulic flow to one cylinder caused to drive one rotor which drives the remaining rotors, the remaining rotors gating hydraulic flow to the remaining cylinders.

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